WHAT IS CLAIMED IS:

1. For use in a single integrated circuit multi-standard demodulator, a frequency domain equalizer for demodulation of a single carrier signal comprising:

a signal multiplier producing an equalized output from a frequency domain input and a frequency domain inverse channel estimate; and

an adaptive inverse channel estimator calculating said frequency domain inverse channel estimate utilizing a least square cost function.

2. The frequency domain equalizer as set forth in Claim 1 wherein said adaptive inverse channel estimator calculates said frequency domain inverse channel estimate utilizing a diagonal correlation matrix.

3. The frequency domain equalizer as set forth in Claim 2 wherein said adaptive inverse channel estimator employs a memory, a forgetting factor employed to calculate a current diagonal element within said correlation matrix from a previous diagonal element within said correlation matrix, and an adaptation and error control constant employed to alter a previous inverse channel estimate matrix element to derive a current inverse channel estimate matrix element, wherein values for said forgetting factor and said adaptation and error control constant are selected such that multiplication by either said forgetting factor or said adaptation and error control constant may be implemented by shift and add operations.

4. The frequency domain equalizer as set forth in Claim 3 wherein said adaptive inverse channel estimator further comprises:

a complex conjugator receiving a delayed input signal;

a signal multiplier receiving both said delayed input signal and an output of said complex conjugator;

a signal adder receiving an output of said signal multiplier and said previous diagonal element within said correlation matrix multiplied by said forgetting factor, a output of said signal adder comprising said current diagonal element within said correlation matrix.

5. The frequency domain equalizer as set forth in Claim 4 wherein said adaptive inverse channel estimator further comprises:

a signal divider receiving said output of said complex conjugator and said output of said signal adder;

a second signal multiplier receiving an output of said signal divider and a frequency domain error estimate; and

a second signal adder receiving an output of said second signal multiplier multiplied by said adaptation and error control constant and said previous inverse channel estimate matrix element, an output of said second signal adder comprising said current inverse channel estimate matrix element.

6. A single integrated circuit multi-standard demodulator comprising:

a first decoder selectively demodulating a multi-carrier signal; and

a second decoder selectively demodulating a single carrier signal, said second decoder including a frequency domain equalizer comprising:

a signal multiplier producing an equalized output from a frequency domain input and a frequency domain inverse channel estimate; and

an adaptive inverse channel estimator calculating said frequency domain inverse channel estimate utilizing a least square cost function.

7. The demodulator as set forth in Claim 6 wherein said adaptive inverse channel estimator calculates said frequency domain inverse channel estimate utilizing a diagonal correlation matrix.

8. The demodulator as set forth in Claim 7 wherein said adaptive inverse channel estimator employs a memory, a forgetting factor employed to calculate a current diagonal element within said correlation matrix from a previous diagonal element within said correlation matrix, and an adaptation and error control constant employed to alter a previous inverse channel estimate matrix element to derive a current inverse channel estimate matrix element, wherein values for said forgetting factor and said adaptation and error control constant are selected such that multiplication by either said forgetting factor or said adaptation and error control constant may be implemented by shift and add operations.

9. The demodulator as set forth in Claim 8 wherein said adaptive inverse channel estimator further comprises:

a complex conjugator receiving a delayed input signal;

a signal multiplier receiving both said delayed input signal and an output of said complex conjugator;

a signal adder receiving an output of said signal multiplier and said previous diagonal element within said correlation matrix multiplied by said forgetting factor, a output of said signal adder comprising said current diagonal element within said correlation matrix.

10. The demodulator as set forth in Claim 9 wherein said adaptive inverse channel estimator further comprises:

a signal divider receiving said output of said complex conjugator and said output of said signal adder;

a second signal multiplier receiving an output of said signal divider and a frequency domain error estimate; and

a second signal adder receiving an output of said second signal multiplier multiplied by said adaptation and error control constant and said previous inverse channel estimate matrix element, an output of said second signal adder comprising said current inverse channel estimate matrix element.

11. For use in a frequency domain equalizer, a method of adaptive inverse channel estimation comprising:

multiplying a frequency domain input from a single carrier and a frequency domain inverse channel estimate to produce an equalized output; and

calculating the frequency domain inverse channel estimate utilizing a least square cost function.

12. The method as set forth in Claim 11 wherein the step of calculating the frequency domain inverse channel estimate utilizing a least square cost function further comprises:

calculating the frequency domain inverse channel estimate utilizing a diagonal correlation matrix.

13. The method as set forth in Claim 12 wherein the step of calculating the frequency domain inverse channel estimate utilizing a least square cost function further comprises:

storing a previous diagonal element within the correlation matrix and a previous inverse channel estimate matrix element within a memory;

employing a forgetting factor to calculate a current diagonal element within the correlation matrix from the previous diagonal element within the correlation matrix; and

employing an adaptation and error control constant to alter the previous inverse channel estimate matrix element and derive a current inverse channel estimate matrix element,

wherein values for the forgetting factor and the adaptation and error control constant are selected such that multiplication by either the forgetting factor or the adaptation and error control constant may be implemented by shift and add operations.

14. The method as set forth in Claim 13 wherein the step of calculating the frequency domain inverse channel estimate utilizing a least square cost function further comprises:

computing a complex conjugate of a delayed input signal;

multiplying the delayed input signal with the complex conjugate; and

adding a result of multiplying the delayed input signal with the complex conjugate to the previous diagonal element within the correlation matrix multiplied by the forgetting factor to produce the current diagonal element within the correlation matrix.

15. The method as set forth in Claim 14 wherein the step of calculating the frequency domain inverse channel estimate utilizing a least square cost function further comprises:

dividing the complex conjugate by the current diagonal element within the correlation matrix;

multiplying a result of dividing the complex conjugate by the current diagonal element within the correlation matrix with a frequency domain error estimate and the adaptation and error control constant; and

adding the previous inverse channel estimate matrix element to a result of multiplying the result of dividing the complex conjugate by the current diagonal element within the correlation matrix with a frequency domain error estimate and the adaptation and error control constant to produce the current inverse channel estimate matrix element.

16. A single integrated circuit multi-standard demodulator comprising:

an OFDM decoder; and

a VSB decoder, said VSB decoder including a frequency domain equalizer comprising:

a signal multiplier producing an equalized output from a frequency domain input and a frequency domain inverse channel estimate; and

an adaptive inverse channel estimator calculating said frequency domain inverse channel estimate utilizing a least square cost function,

wherein said frequency domain equalizer utilizes hardware employed for said OFDM decoder.

17. The demodulator as set forth in Claim 16 wherein said adaptive inverse channel estimator calculates said frequency domain inverse channel estimate utilizing:

a diagonal correlation matrix;

a forgetting factor in calculating a current diagonal element within said correlation matrix from a previous diagonal element within said correlation matrix;

an adaptation and error control constant in altering a previous inverse channel estimate matrix element to derive a current inverse channel estimate matrix element,

wherein values for said forgetting factor and said adaptation and error control constant are selected such that multiplication by either said forgetting factor or said adaptation and error control constant may be implemented by shift and add operations within said hardware employed for said OFDM decoder.

18. The demodulator as set forth in Claim 17 wherein said adaptive inverse channel estimator employs a memory within said hardware employed for said OFDM decoder to store said previous diagonal element for said correlation matrix and said previous inverse channel estimate matrix element.

19. The demodulator as set forth in Claim 18 wherein said adaptive inverse channel estimator further comprises:

a complex conjugator receiving a delayed input signal;

a signal multiplier receiving both said delayed input signal and an output of said complex conjugator;

a signal adder receiving an output of said signal multiplier and said previous diagonal element within said correlation matrix multiplied by said forgetting factor, a output of said signal adder comprising said current diagonal element within said correlation matrix.

20. The demodulator as set forth in Claim 19 wherein said adaptive inverse channel estimator further comprises:

a signal divider receiving said output of said complex conjugator and said output of said signal adder;

a second signal multiplier receiving an output of said signal divider and a frequency domain error estimate; and

a second signal adder receiving an output of said second signal multiplier multiplied by said adaptation and error control constant and said previous inverse channel estimate matrix element, an output of said second signal adder comprising said current inverse channel estimate matrix element.